Sketchnoting: A Visual Literacy Methodology

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Abstract. In recent times, sketchnoting has become more popular due to its approach to visual sense making and visual synthesis resulting in instructors across disciplines increasingly implementing it into their curriculum. Being that it is heavily focused on visual sense making, the question arose if there is an opportunity to explore sketchnoting in the greater context of Visual Literacy? In an effort to investigate and understand the similarities and differences of various Visual Literacy definitions and explore their relationship to sketchnoting in general, select definitions were sketchnoted to uncover patterns and connections to its principles of listening, synthesizing, and visualizing. Building on these visual explorations this chapter discusses the introduction of sketchnoting at two different industrial design programs and the connection to all five pillars of Visual Literacy Theory: visual learning, visual language, visual communication, visual thinking and visual perception. The outcomes give insight for how sketchnoting, as a methodology, could support building Visual Literacy competency by increasing students' observation, listening, and visualization skills, aiming at fostering a sense of general empowerment.

Keywords: Sketchnoting, visual empowerment, visual listening, visual sense-making

Over the past 50 years visual literacy specialists, scholars, educators, students, designers, and professionals alike have taken different angles to discuss and analyze Visual Literacy (VL) as it applies to their respective domains, research foci, or interests (Avgerinou & Pettersson, 2011). This should not come as a surprise, since most environments have been and increasingly are influenced by visual input and output. Velders (1999) suggests and Petterson (2019) reiterates that VL could, in fact, be dated as far back as Aristotle, Pythagoras, Socrates, Plato, and even cave paintings. However, the term itself was defined in the late 1960s by John Debes as a response to the first conference on VL.

Debes' (1969) definition focused on the development of vision-competencies that are fundamental to human learning, enabling a person to make visual sense out of their environment, while providing competencies to communicate with others and being able to appreciate and comprehend masterpieces of visual communication (see Figure 1). It could be argued the latter might imply that VL is a way of passive comprehension more so than an active engagement.

While acknowledging that there are many other definitions, to this day, the VL community who identifies with the International Visual Literacy Association (IVLA), builds on Debes original interpretation (Avgerinou, 2012).
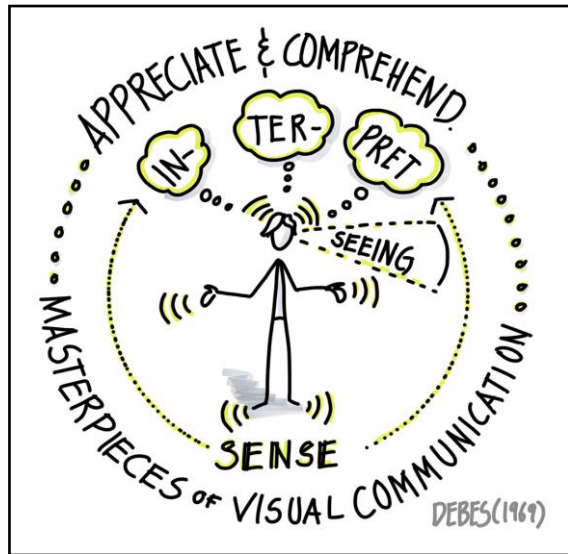
Figure 1: An introduction and visual primer to sketchnote interpretations as discussed in 3.1 Exploring Visual Literacy Definitions Through Sketchnotes based on the first definition of Visual Literacy originated by John Debes (1969).

In an effort to work towards a common and widely accepted definition that reaches across disciplines, as well as to further VL research, in 2011 Avgerinou and Pettersson (2011) proposed a theory of VL to be "grounded on the following conceptual components: visual communication, visual learning, visual language, visual perception, and visual thinking" (p.5).

In response, the research team set out to discuss sketchnoting, originally received as visual, non-linear notetaking (Rohde, 2013), in the context of this theoretical framework with the aim to explore sketchnoting as a methodology to foster VL. Although it has been pointed out that "being visual literate does not require a person to be skilled in a visually artistic area" (Pettersson, 2019, p.69), there seems to be an understanding that having skills to create and express oneself visually can support VL (Flory, 1978; Hortin, 1984; Pettersson, 1989). The research builds on the notion that having visualization skills supports VL competency.

CONTRIBUTIONS OF SKETCHNOTING TO VISUAL LITERACY

Sketchnoting provides an alternative approach to notetaking by creating visual maps of what was heard, seen and thought (Rohde, 2013). Not unlike concept mapping, a visual method for structuring and representing knowledge (Kolko, 2011), sketchnoting combines simple images (created from basic geometric shapes, squares, triangles, circles, lines, and dots) with words, frames, arrows, and dividers, providing a method to break out of traditional linear notetaking (Dimeo, 2016; Erb, 2012). Often performed in real-time, sketchnoting fosters rapid synthesis of information. The notes translate visual and auditory, or written input into visual maps. These may contain mainly words placed in chunks on the page and then framed with varying containers, highlighted with color, connected through lines and arrows and do not necessarily require actual imagery (McGregor, 2019). The notes themselves are the visual output. Sketchnoting can turn traditional, handwritten or typed notes into meaningful synthesized visual interpretations of discussions, lectures, debates, or meetings (Rohde, 2013). Sketchnoting can also be applied to organizing, planning, idea development, or visually exploring connections (McGregor, 2019; Paepcke-Hjeltness & Lu, 2018; Rohde, 2013).

People who frequently sketchnote (sketchnoters) often create a visual library of shapes, forms, icons, images, and arrows to draw from effortlessly. Many a time, the visual libraries have been carefully developed and practiced (Paepcke-Hjeltness, Mina & Cyamani, 2017; Rohde, 2013; Smith, 2012). Drawing the same object frequently gives the sketchnoter confidence and command, making it easy for them to repeat it on demand.

From its origins in 2006, when the term was first coined by Rohde, sketchnoting has developed into a global community of practitioners who share their expertise through workshops such as visual thinker, speaker, and teacher Eva-Lotta Lamm (Lamm, 2020) or the Online courses offered by Doug Neill: Verbal to

Visual (Neill, 2020). Sketchnoting has made its way into K-12 education where some teachers are embracing sketchnoting in their pedagogy (Perry & Weimar, 2017; Sykula, 2019) with increasing discussions around the potential for sketchnoting to support learning (Caviglioi, 2019; Duckworth, 2017; McGregor, 2019; Perry et al., 2017).

As a precursor to sketchnoting, Roam (2008) has been giving structured advice through his book "*The Back of the Napkin, Solving Problems and Selling Ideas with Pictures*" on how to approach visualization skill building in a simple and straight-forward way. He developed a methodology for visual thinking to be applied to new ways of looking at business. Sketchnoting relates to this method-logy as it is also based on the framework of using basic shapes such as squares, triangles, circles, lines, and dots to break down complex forms and visualize abstract concepts.

The International Forum of Visual Practitioners (IFVP), established since the 1990s and highly influential on sketchnoting, is a community of graphic recorders and facilitators who seek to help people see what they mean. They visually capture information, communicate ideas through visual maps, and kindle creative thinking (IFVP, 2020). This group of professionals acts as visual facilitators or graphic recorders in business meetings, large-group settings (as diverse as governmental groups), corporate entities, or communities. Whereas sketchnoting is more often for the individual's benefit, graphic facilitation is for the benefit of a larger audience. The underlying method is the same as in sketchnoting where the facilitator or notetaker visually listens, synthesizes, and interprets discussions in real-time, and captures the outcomes on large-scale paper or whiteboards creating visual maps of what was said and discussed. According to Brandy Agerbeck (2012) the graphic facilitator brings value to meetings in form of providing a platform for participants being listened to, visualizing a shared understanding and making discussions tangible through the visual artefact that can be seen and touched. Because these maps show discussion points, visualize patterns, make connections and often incur-porate metaphors to synthesize information into

recognizable images for the audience (Sibbet, 2012). Sketchnoting and graphic facilitation, both fall under the lower fidelity end of the visualization spectrum, by omitting unnecessary details and focusing on rapid capturing and synthesis of thoughts and concepts (Agerbeck, 2012). It is important to mention, that low fidelity does not imply inferiority or a lack of quality. Instead, it pertains to being able to quickly visualize and abstract complexity by finding patterns, making it manageable through basic shapes, familiar images, and metaphors. The advantage of such visual style, as opposed to high fidelity photorealistic renderings, is that it speeds up the process, can be learned fairly easily and does not require artistic ability (McGregor, 2019).

Sketchnoting has also been used as a problem framing and idea generation framework. It can be applied to synthesize complex information visually, to explore and visualize problems as well as to develop high-level concepts (Marquardt & Greenberg, 2012; Paepcke-Hjeltness & Lu, 2018).

Sketchnoting is becoming more popular due to its approachable way of visual sensemaking and visual synthesis. Instructors across disciplines are implementing it into the curriculum more and more (Dimeo, 2016; Perry & Weimar, 2017; Paepcke-Hjeltness, Mina, & Cyamani, 2017). Figure 2 shows the basic building blocks of sketchnoting and how to visually break down select artifacts as they are commonly used in the introduction of sketchnoting (Rohde, 2013; Lamm, 2019).

Sketchnoting is not an "end all" to information synthesis, and not everybody adapts and implements it as quickly as others, however, it has shown to be a refreshing approach to visual synthesis and storytelling beyond the disciplines of design (Paepcke-Hjeltness et al., 2018).
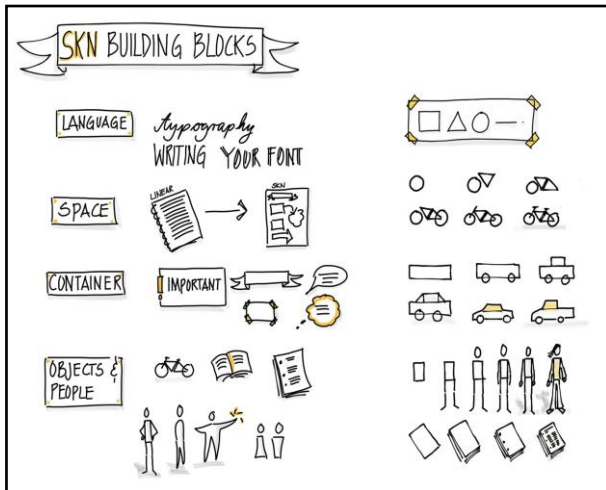
Figure 2. Sketchnote building blocks. A visual breakdown of the elements of sketchnoting (Paepcke-Hjeltness, 2018).

Figure 3. A Primer of Visual Literacy. Early definitions of Visual Literacy. Sketchnotes based on Pettersson's interpretation of definition (2019).

The key to sketchnoting lies in its simplicity in filtering information to encapsulate the essence towards a universal understanding. In comparison, *A Primer of Visual Literacy* (Dondis, 1973) laid out a complex approach to a universal understanding of Visual Literacy from the basic elements of visual communication, to the anatomy of a message, to the how and why, to just name a few. In its simplest terms this understanding as visualized in Figure 3, relates to sketchnoting through the process of seeing, understanding, and sharing meaning.

The research team aims at an alternate approach to understanding the differences and similarities of the various definitions of VL and their connection to sketchnoting by visualizing them in order to identify patterns. The very comprehensive overview of the history and development of VL as it is laid out in the book *Information Design. Image Design.* by Rune Pettersson (2019) was the basis for this visual method. Standing on the shoulder of giants and learning from the experts, *Information Design, Image Design* was used as the foundation for this visual analysis as both authors of this book chapter are novices of VL research and theories.

VISUAL LITERACY DEFINITIONS VISUALLY ANALYZED THROUGH SKETCHNOTES

Interestingly, the early definitions of VL focused mainly on perceiving, comprehending, and teaching, as well as sharing universal meaning as shown in Figure 1 and 3 (Debes, 1969; Dondis, 1973; Cochran, 1976; all as cited in Pettersson, 2019). This is especially interesting to sketchnoting, due to its focus of breaking down complexity to visually communicate through an almost universal visual language as it compares to the basic building blocks of sketchnoting as seen in Figure 2.

Flory's (1978) definition of VL is not only geared towards thinking visually, but also expressing oneself visually. Pettersson (2019) described Flory's approach to Visual Literacy consisting of:

1) A visual language exists
2) People can and do think visually
3) People can and do learn visually
4) People can and should express themselves visually

The latter being the aspect that relates the closest to sketchnoting (see Figure 4).

Visualizing the various definitions as they were discussed by Pettersson (2019) the common denominator of competency to create visually becomes apparent. Some of the definitions clearly refer to the ability to be able to draw (see Figure 5), write (see Figure 6), write and create (see Figure 7), or create (see Figure 8) whereas others refer to the ability to communicate (see Figure 9), as well as express and practice (see Figure 10).

In sketchnoting the various definitions of VL, the research team created a shared visual understanding using visual representations of terminologies of commonly known and well-established images. For example:

• the process of *thinking* is represented as a cloud.
• *verbal communication* is represented by a speech bubble.
• l*earning* is shown through a light bulb.
• *writing* is represented through lines drawn by a stick figure.
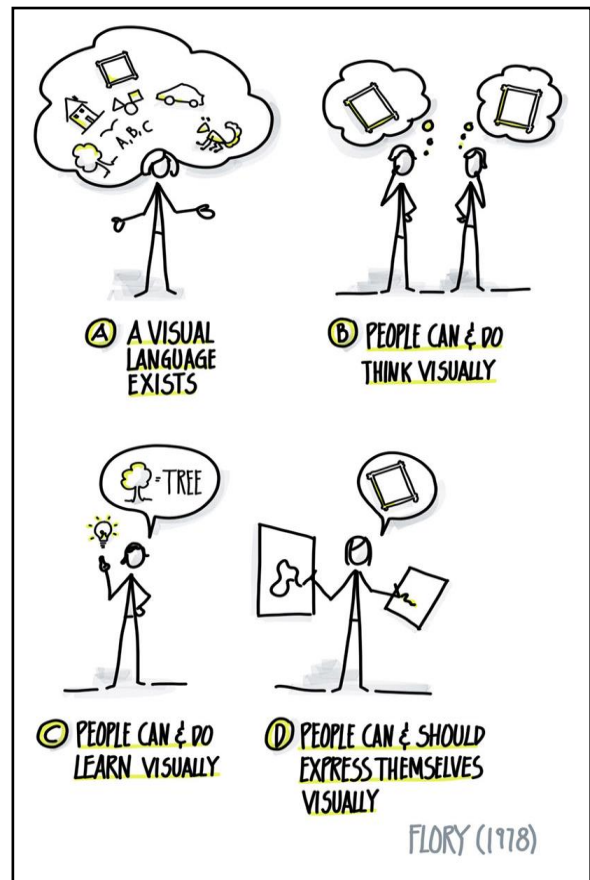• *seeing* is shown through two dotted lines drawn from the eye to the object

Figure 4. Flory defines visual literacy, which includes expressing oneself visually. Sketchnotes based on Pettersson's interpretation of definition (2019).
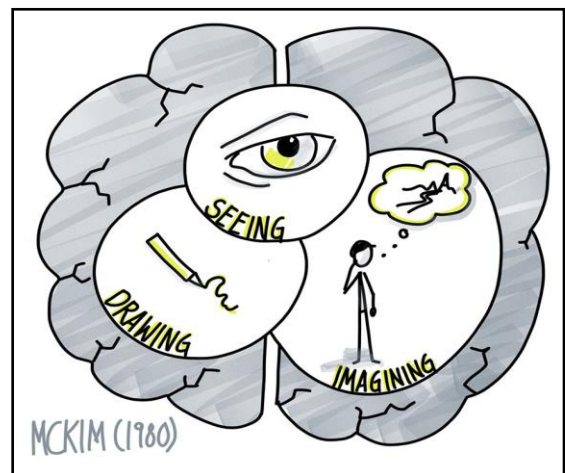

Figure 5: Drawing. McKim Diagram of seeing, imaging, and drawing. Sketchnotes based on Pettersson's interpretation of definition (2019).
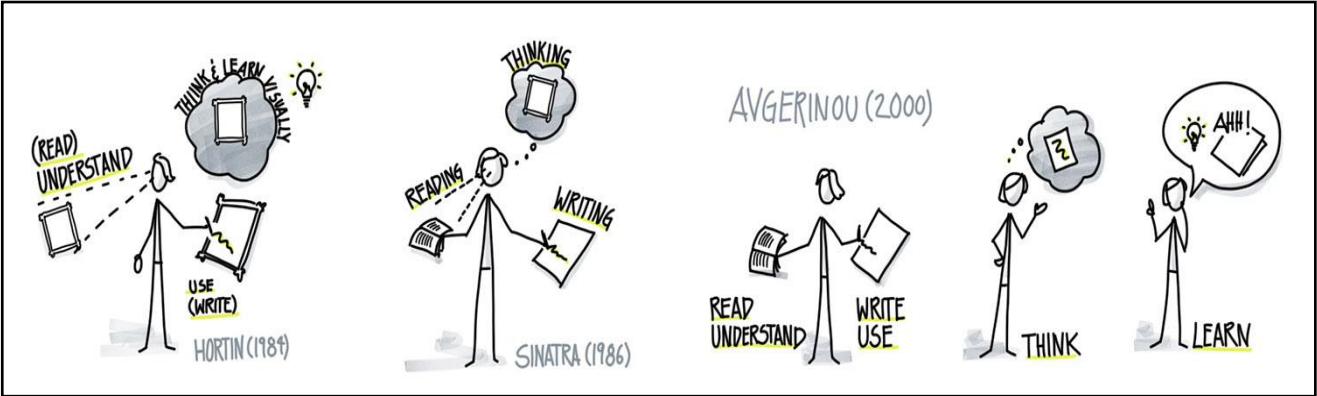
Figure 6. Writing. Reading, writing, drawing to visualize. Definitions by Hortin, Sinatra, and Avgerinou. Sketchnotes based on Petterson's interpretation of definitions (2019).
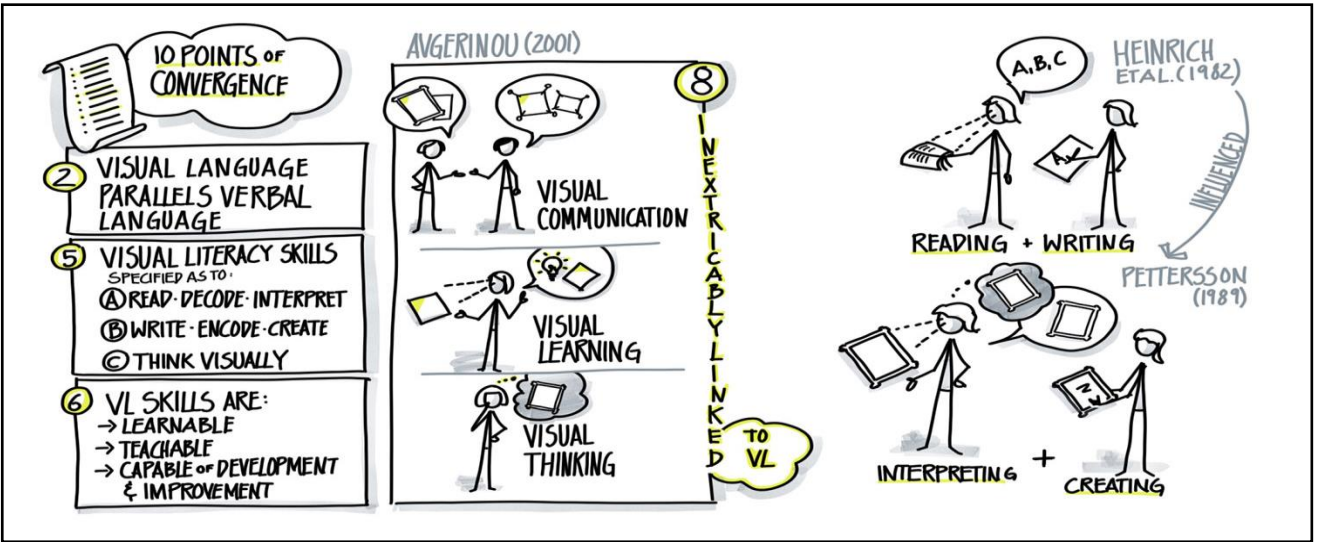

Figure 7. Writing and creating. Using writing and creating to express oneself visually. Definitions by Avgerinou, Heinrich and Pettersson. Sketchnotes based on Pettersson's interpretation of definition (2019).
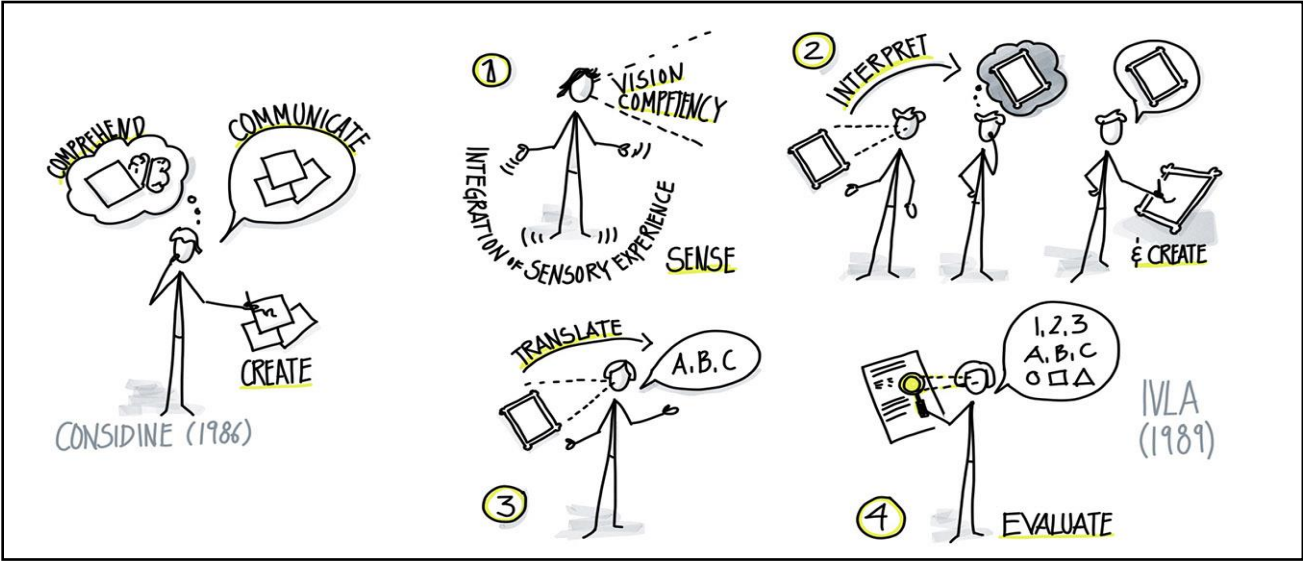
Figure 8. Creating. To express oneself visually by creating. Definitions by Considine and IVLA. Sketchnotes based on Pettersson's interpretation of definition (2019).
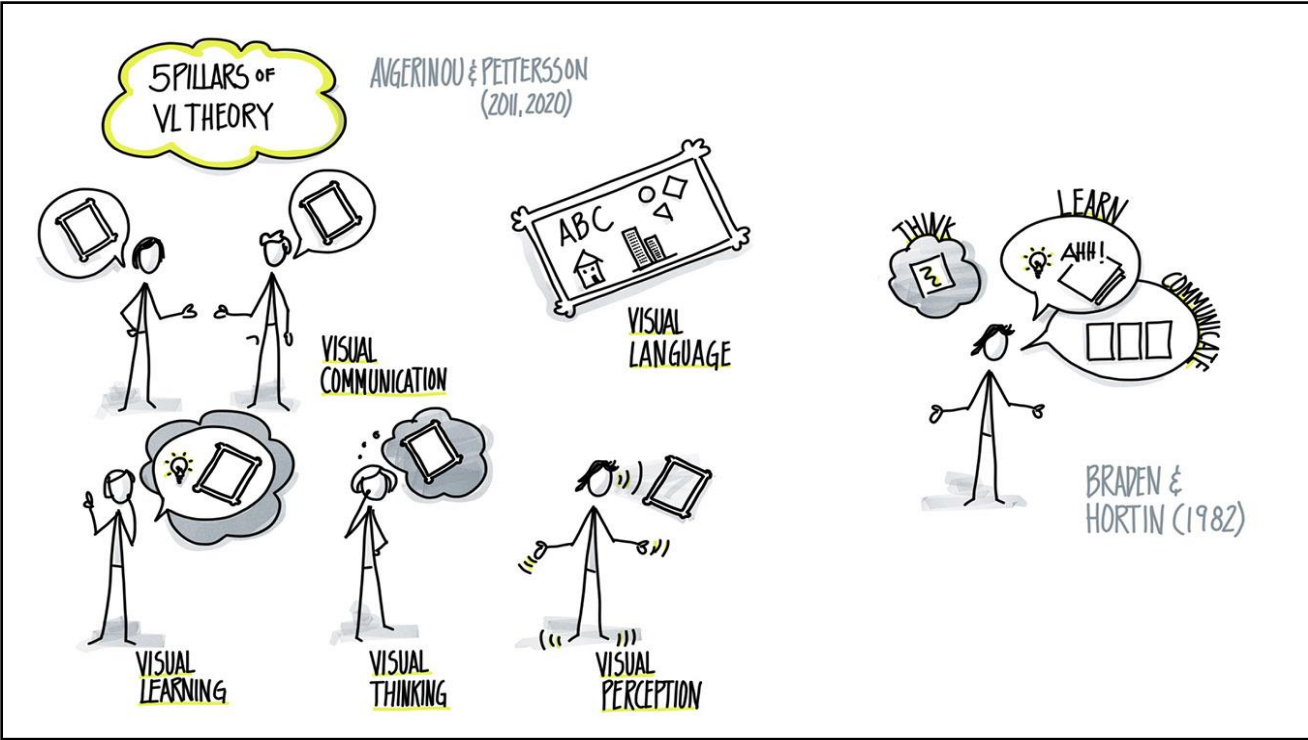

Figure 9. Communicating. Types of communication-based on visual language. Definitions by Braden & Hortin, Avgerinou & Pettersson. Sketchnotes based on Pettersson's interpretation of definition (2019).
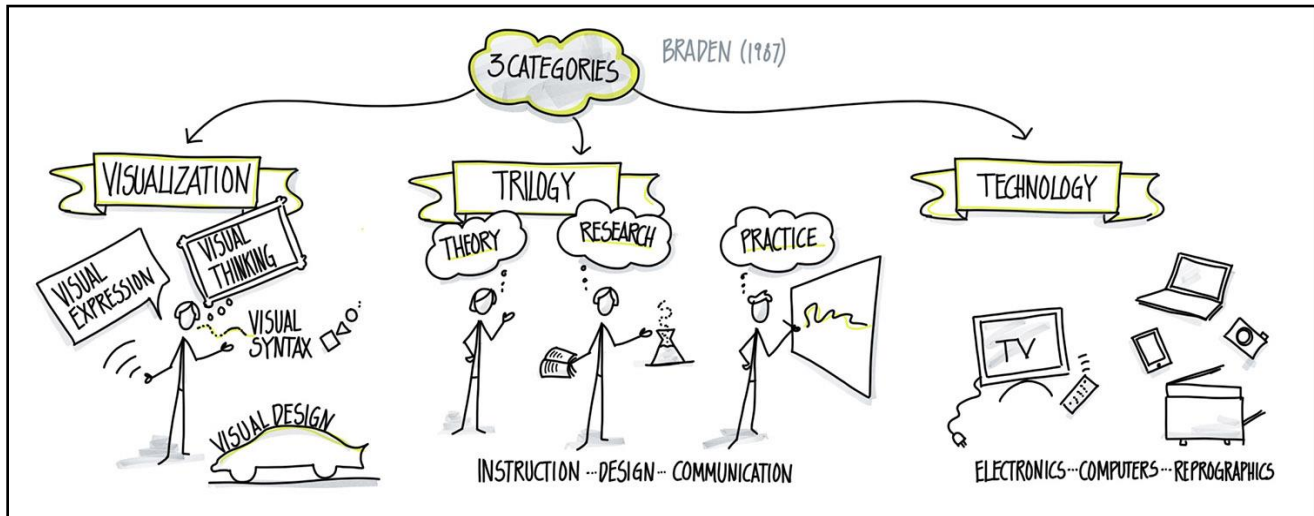
Figure 10. Expressing and practicing. Three categories include visualization, trilogy, and technology. Definition by Braden. Sketchnotes based on Pettersson's interpretation of definition (2019).

The most encouraging definition toward making a case for sketchnoting is Pettersson's (2019) discussion of Bopry's focus on the two-way translation from visual to verbal language and the inclusion of visual grammar and syntax (see Figure 11).

Sketchnoting's visual sense making approach of combining verbal and visual inputs into combined visual maps builds on Paivio's Dual Coding theory (1990), which assumes that there are two separate systems that are yet connected, the verbal and the non-verbal (see Figure 12). Where verbal and non-verbal stimuli pass through the sensory system creating representational connections leading to verbal and non-verbal responses. When connecting Dual Coding theory to Rohde's representation of how sketchnoting creates visual maps by listening, synthesizing and visualizing it could be argued that sketchnotes are visual representations of internal processes as described by the Dual Coding theory. Integrating Bopry's VL definition a case could possibly be made for sketchnoting supporting the two-way translation from verbal language to visual language and the other way around.
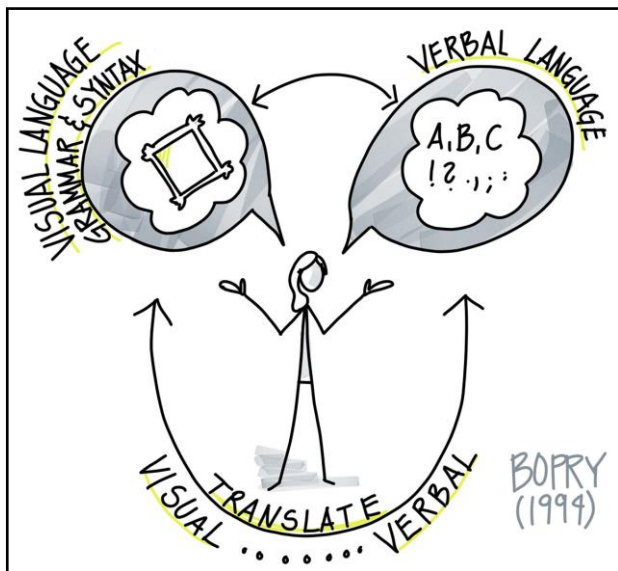

Figure 11. Two-way translation. Two-way translation of visual and verbal, based on definition by Bopry. Sketchnotes based on Pettersson's interpretation of definition (2019).
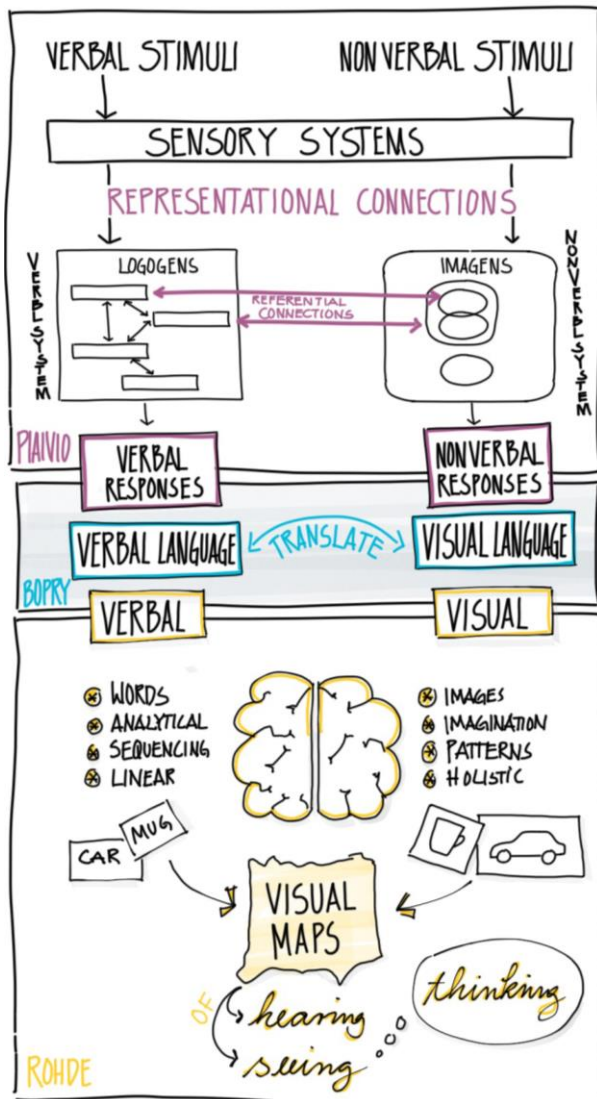
Figure 12. Paivio's Dual Coding theory (1990) and Rohde's Visual Maps (2013), connected through Bobry's VL definition as interpreted by Pettersson (2019).

EXPLORING SKETCHNOTING AS A METHODOLOGY: TWO UNIVERSITY STUDIES

Sketchnoting was implemented and its impact on students learning and success was investigated at two industrial design programs. At University 1, sketchnoting was introduced through hands-on workshops or lectures and reinforced in class sessions thereafter. At University 2 sketchnoting was introduced the same way. In addition, a student organization

called Sketchsquad was founded by one of the authors. During weekly meetings students practiced sketchnoting, developed their own system of team visual scribing and often conducted graphic recordings of lectures and conferences (Weliever, 2017).

The goal of investigating sketchnoting was to get a better understanding of its benefits to student learning and confidence building. As well as exploring how it may address the five pillars of the VL theory, visual communication, visual learning, visual language, visual perception, and visual thinking as originally defined and further refined by Avgerinou and Pettersson (2011, 2020).

In response, the research was driven by investigating if sketchnoting can provide a systematic methodology to analyze, synthesize, and communicate ideas and information visually. The researchers were interested in finding answers to the following questions:

1. How might sketchnoting foster varying components of visual literacy?
2. How can we teach sketchnoting as a visual framework to empower students?
3. What are additional opportunities for sketchnoting beyond a visual note-taking tool?

DATA COLLECTION

Student Interviews and Surveys. Through one-on-one interviews and Online surveys across both institutions the researchers collected data to gain insight into how and when students are using sketchnoting and what kind of benefits the students derive from using it.

University 1: Freshman to Senior Level

Over the course of 3 years, approximately 760 students in varying design disciplines ranging from freshman to senior level were taught sketchnoting. The majority of students (two design freshmen groups) was introduced to sketchnoting during a 50-minute hands-on lecture (n=580). A medium-sized mixed group

of industrial design students (n=120) was introduced to sketchnoting during a hands-on 1.5-hour lecture.

For this particular study the research team collected data from a group of industrial design sophomores (n=60) who participated in a 1.5-hour hands-on sketchnote lecture. Data was also collected through unstructured interviews with a small group of students (n=3), who met over the course of 15 weeks for weekly practice sessions.

Using Sketchnoting in Class

Leading by example and in an effort to further expose students to the benefits of visually synthesizing and communicating information, the researcher applied sketchnoting to class preparation, in-class announcements, and visualization of design methodologies, or process steps (see Figure 13). As per instruction, many of their students used sketchnoting for process planning and reflection (see Figure 14 and 15) and research synthesis and idea development. The anticipated benefits of this approach are rooted in learning to visually synthesize information, practicing to visually communicate through universal visual language, understanding visual notes from others, and practicing thinking visually and to think on paper.
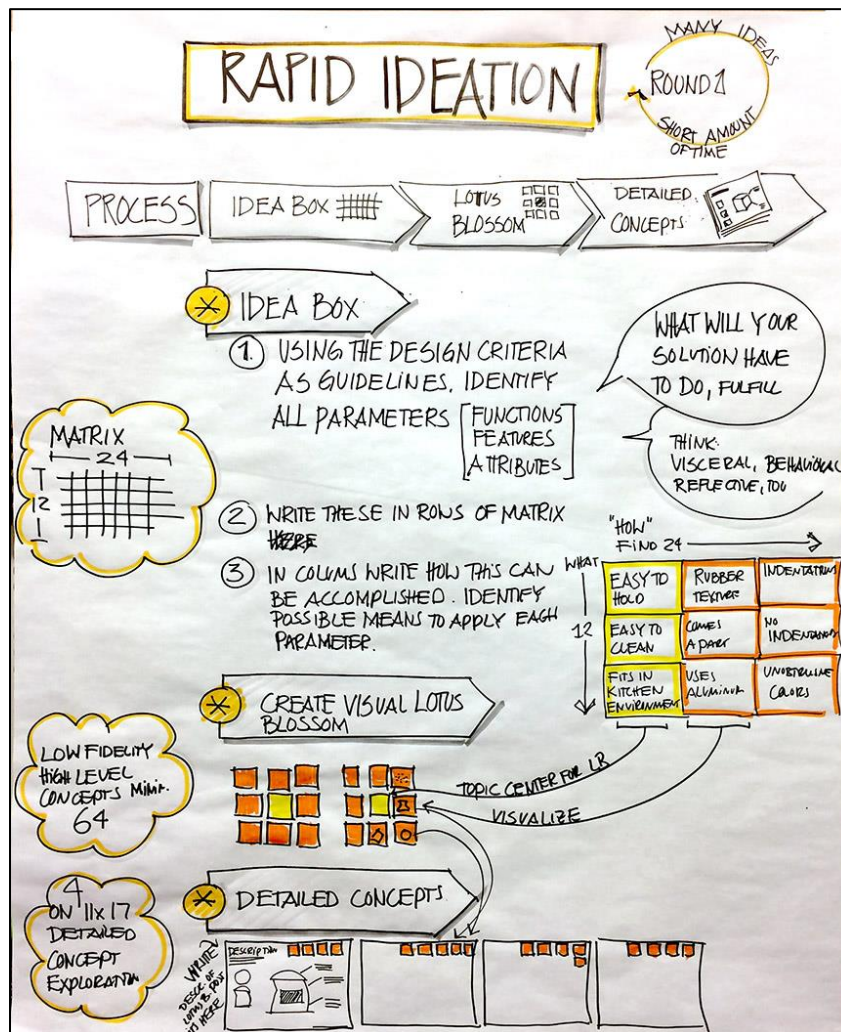

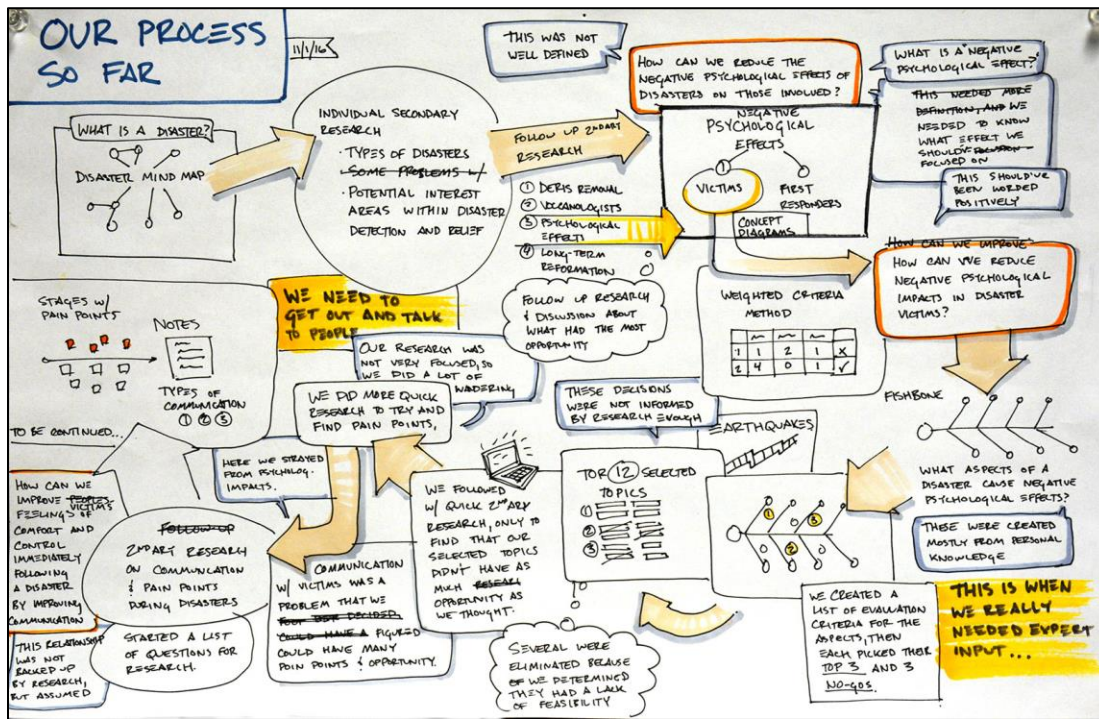Figure 13. In-class brainstorm activity outline (2018).

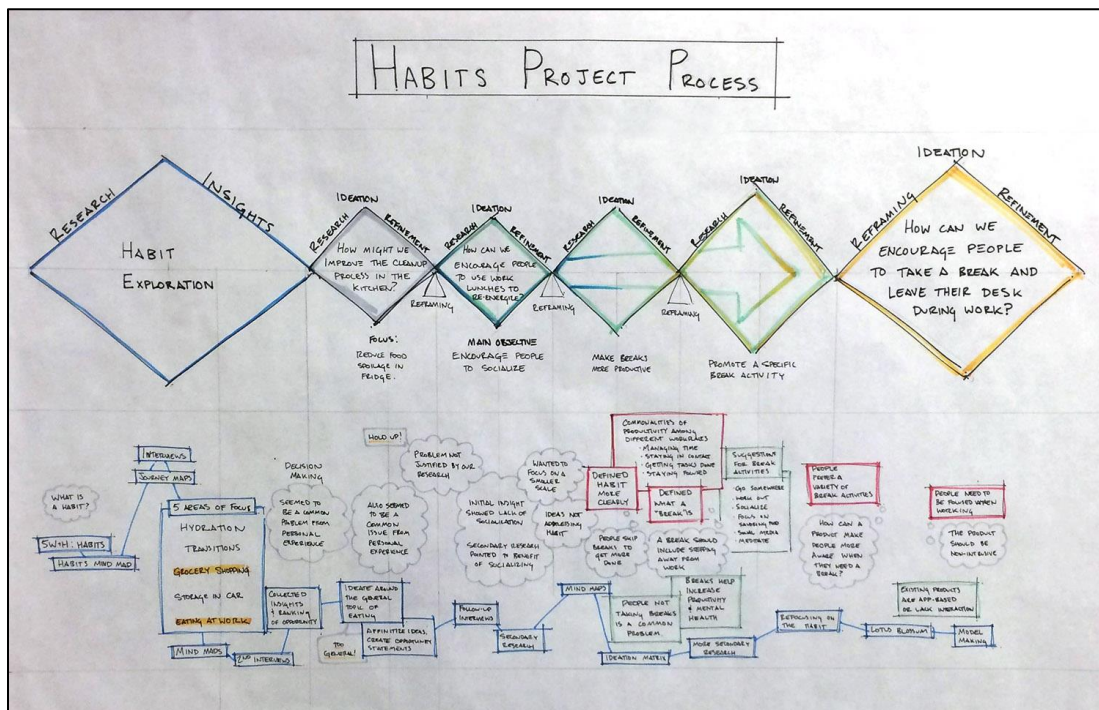Figure 14. Project process sketchnote (2018).

Figure 15. Project process reflection sketchnote (2018).

Survey Responses

An online survey was sent out to 60 industrial design sophomore students, addressing questions relating to sketchnoting and creativity. The following shows a summary of the responses.

- 70% use sketchnoting to take lecture notes in industrial design and non-design classes, while reading textbooks, studying for a test, planning, and/or for idea generation.

- 47% think sketchnoting fosters creativity.

- 53% think it fosters creativity a little bit.

- 0% think it does not foster creativity at all.

- 83% of these students confirm that sketchnoting has been useful to different degrees (17% extremely useful, 40% moderately useful, 25% slightly useful).

Observations of Small Study Group

As mentioned above, a smaller group of students, who was introduced to the 1.5-hour sketchnote introductory session was followed over the course of an entire semester. During weekly meetings the students reflected upon their progress as they implemented sketchnoting in their day-to-day practices. Early success included:

- Students remembered everything due to study their notes while the teacher recapped material in class. It gave the students positive feedback that taking the time to compile study sketchnotes paid off.

- After the first two weeks, students considered sketchnoting fun and relaxing.

- After five weeks, they were able to write down less, at the same time, what was written was more meaningful due to how information was synthesized visually.

- There were fewer notes, the notes were clearer, better organized, and more focused.

- The students voiced feeling satisfied and empowered.

- After six weeks of practicing sketch-noting, it became easier and students started to apply visuals systematically and developed their own visual language and system of images, page layout and structure.

- Additional skill-building sessions, i.e. exploring typography and developing a joint visual library as a team, lead students to develop their lettering and further increased their sketch confidence.

In summary, the students put pen on paper and sketched with more confidence as compared to the first day. They all took more notes than before and the notes took up less space, because they synthesized the information visually. Another positive perk, the students were looking forward to class so they could take notes and practice. Figure 16 shows a visual reflection of sketchnoting and its benefits compiled by the small group, the research assistants and faculty.

University 2: Sketchnoting in student organizations

At University 2 sketchnoting was originally only introduced to students within the classroom. The reception was very positive, and the students wanted to continue the exploration of how to create a bigger visual library beyond what has been taught in class. As a response, a student organization was created, Sketch-squad. The driver for the student organization was to further the understanding and the

development of skills for sketchnoting. Led by a faculty member, the students started meeting weekly to exchange ideas for new visual toolkits developed from their class notes. During the weekly sessions students developed communication strategies and shared their stories and reflections through drawings and writings. Early on the majority of the students in Sketchsquad was made of students with a drawing background. Over time it became a cross-disciplinary club with students from engineering, marketing, and psychology. The common ground they shared across the disciplines was their interest in visual learning, visual communication, visual thinking, and the development of a visual language to enhance their own learning and being able to share ideas more effectively.

Figure 16. Class notes. Students sketchnoted their lectures in different classes (2019).

As students built up their visual library and confidence, they began to expand into new realms of creative expressions, such as providing graphic recording services around the campus by capturing content visually in real-time. These involved large size visualizations of lectures and meetings that students had not explored and attempted before. As a result, sketchnoting became not only a personal tool but a tool for others to see and understand new ideas. They became graphic recorders.

Developing a team graphic recording system

The nature of life-sketchnoting or graphic recording, capturing everything in real-time and making visual sense out of it is challenging. Therefore, the students developed their own process system and visually recorded in teams

where one student would write down information and then relay that information to another student to draw it. Whereas a third person would apply color to create visual hierarchy. This system, developed by the students, scales up to eight people working on one graphic recording simultaneously.

Observations of Student Organization

According to the students, this overall process and the exposures to a campus-wide audience empowered them in numerous ways. One student described as having an advantage during interviews, because prospective employers were intrigued by this style of note-taking and that they can create visual content in real-time. Another student said, *During interviews and portfolio reviews people saw that I could do CAD, sketch, ideate, but when they saw that I can sketchnote, they were like Wow, that's super cool tell me more about that!* (Paepcke-Hjeltness & Lu, 2018, p. 6).

Due to the popularity of this student group, more people wanted to learn this technique, so workshops were offered. Local organizations, companies, and classes started inviting this group of visual sketchnoters to their communities to learn about sketchnoting. Students help lead the workshops to teach others how to expand their visual libraries and reinforce the importance of communication, thinking, and learning with images. Because students felt empowered by their skills, they were confident in expressing themselves not just visually but also verbally. Their confidence in their work created a positive ripple effect influencing them in all areas of their professional development. Figure 17 shows a workshop led by students to teach others how to visually express their thoughts, ideas, and information by leveraging sketchnoting.

SKETCHNOTE CONFERENCE IN HIGHER EDUCATION

Due to the overwhelmingly positive response, the student organization soon expanded to new campuses. Students from different universities saw the potential and power of sketchnoting and felt the need to have a club that exercises visual expressions on their own campus. Providing a platform for these new merging sketchnoting communities to learn, grow and network, a first-ever sketchnoting conference, hosted at University 2 was created. During this day of exploration, guest speakers and professionals came to share their knowledge and ideas around visual communication, visual thinking, and visual learning. One of the workshops was around mindmapping which helped students see their trail of thoughts and ideas on paper (see Figure 18). Students had to use visuals to express the flow of their thoughts, revealing new interesting intersections between topics they did not fully see at a glance. The exercise gave students a new way to approach visual thinking, which blended well with their sketchnoting toolkit. Students also gained a lot from the keynote speaker, Brandy Agerbeck, who has been in the graphic facilitation industry for over 20 years. Her expertise in visual language and how to dissect auditory information into visual depictions was extremely powerful for students. One student said, *Brandy's workshop and presentation gave me hope to do sketchnoting as a career which I never saw happening.* Multiple students gave similar feedback about the potential of sketchnoting and how it can make a difference in their professional careers. Another student became so invested in sketchnoting that they made connections with a graphic recording studio and got commissioned to help with their projects. From the success of that project, they received an internship to work there over the summer. Their goal now is to continue their journey towards leveraging visual communication and hopefully find a full-time job doing graphic recording after graduating.

Figure: 17. Workshop. Students leading sketchnoting workshop at a university to teach other students how to sketchnote (2019).

Figure 18: Mindmapping with sketchnotes. Students used sketchnotes to mind-map their thoughts at the sketchnoting conference (2019).

ADDRESSING SKETCHNOTING IN THE CONTEXT OF THE FIVE PILLARS OF VL THEORY

In 2011 Avgerinou and Pettersson published *Toward a Cohesive Theory of Visual Literacy (2011)*, their approach to defining a comprehensive VL theory addressing the wide array of disciplines and studies pertaining to it. Based on a discussion and synthesis of studies that emerged since the late 1960's, they proposed "that a theory of VL should be grounded on the following conceptual components: visual perception, visual language, visual learning, visual thinking, and visual communication" (p.5). In their article the focus was on discussing the aspect of visual language (ViL) in more detail. Nine years later they completed their comprehensive examination and synthesis of VL literature and completed the remaining pillars in: *Visual Literacy Theory, Moving Forward* (Avgerinou & Pettersson, 2020).

Following are the researchers' interpretations of the five pillars laid out by Avgerinou & Pettersson as they relate to sketchnoting. We are aiming at making a case for sketchnoting as a VL methodology correlating to aspects of VL theory by addressing each of the pillars individually not only through our interpretations, but also through the students' voices from our interviews and surveys.

1) Visual language

Visuals range in fidelity and detail, from simple line drawings to realistic drawings, from abstract diagrams to photographs. What all have in common is that they are types of representations, whether in print or digital, in virtual reality or imaginative in someone's mind. Interpreting those visuals as well as creating them requires an understanding of the rules of their composition of language building blocks. This involves being able to think visually and to learn visually (Avgerinou & Pettersson, 2020) in order "a) to read/decode/interpret visual statements, and b) to write/encode/create visual statements" (p.444). Although each sketchnoter has their own handwriting and sketchnotes look

very different, there is a common framework each sketchnoter follows in their own way. The building blocks as seen in Figure 2 lay out the foundation, a toolkit for a global understanding of how to apply sketchnoting. In addition, each sketchnoter commonly develops their own visual libraries as previously discussed (Paepcke-Hjeltness, Mina & Cyamani, 2017; Rohde, 2013; Smith, 2012). The students responses are as follows.

- *I like to use thought bubbles in my notes to help me think through something.*

- *I like using sketchnotes for instructions, for instance if I'm learning a new tool there's a lot of steps which I use sketchnotes to break down the process.*

- *I usually write out notes in bullet form to get the information down, then I understand and visualize through sketchnoting.*

2) Visual thinking

Creating visual maps is at the core of sketchnoting, building these maps requires visual thinking on paper, allowing the mind to see the page as an open canvas, building on what was heard, or seen and making visual sense out of it. Thinking on paper is a skill that can be learned through practice. (Roam, 2008; Rohde, 2013, Paepcke-Hjeltness & Henry, 2017). According to Avgerinou and Pettersson (2020) visual thinking is linked to visual-spatial understanding as well as to being creative, being able to "analyze, interpret, and present visual information, and to communicate ideas in visual form" (p.449). Moreover, they address that visual thinking is a "powerful tool for learning as images can facilitate our understanding of abstract ideas and complex relationships" (p.449), which is at the heart of sketchnoting; breaking down complexity using simple shapes. The students' responses are as follows.

- *I think that sketchnoting is a great way to capture a train of thought for visual thinkers.*

- *Sketchnoting helps me think because I do not need to care how neat or cool my sketches need to be, it's very laid back so I can focus on the creation part and not the fidelity.*

- *It is great for brainstorming ideas, it's quick and easy to build up ideas visually.*

3) Visual learning

Through learning one acquires new knowledge or skills. Referring to dual coding theory, the combination of verbal and non-verbal messages can improve learning and retention (Clark & Paivio, 1991). By sketchnoting complex systems, creating visual maps thereof, one has to understand the underlying meaning or theory first before being able to visualize them (Paepcke-Hjeltness, Hetherton & Grote, 2018). This understanding can lead to learning and retention. Visual learning is as much comprehension of visual messages as it is creation of visual messages. Simplifying complex information, being able to communicate visually, simultaneously processing displayed relationships and being able to communicate patterns and connections holistically summarizes visual learning ability (Avgerinou & Pettersson, 2020). The students' responses are as follows.

- *Being a visual learner, I am now able to better visualize thoughts and ideas. It is very helpful, and I am excited to create my own style within it to supplement my learning.*

- *It is great for class notes because visuals help me learn and remember the content.*

- *Sketchnoting helps me stay awake in classes, I doodle a lot already so now I'm doodling the stuff I'm learning.*

4) Visual Communication

Communication is "a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior" (Merriam-Webster's Collegiate Dictionary, 2020). Successful communication is a two-way street, a message is sent and received. Sketchnoting is not always geared towards sending messages as sketchnotes are sometimes only meant for the sketchnoter. However, the commonly used building blocks and the approach to break down complexity using basic shapes supports the idea that sketchnotes could be understood widely. The students' responses are as follows.

- *Sketchnoting is a creative way to organize thoughts and make it easier to understand. It might not always be necessary for one own's notes but if someone else was reading them it would make the ideas clearer and more organized.*

- *Sketchnoting is somewhat useful, it brings out inner thoughts and creativity.*

- *It is a creative way to organize thoughts to make them easier to understand.*

5) Visual perception

Could be understood as the processing of one's environment through the senses, with a focus on visual stimuli and non-verbal communication. If visual perception is at the heart of VL theory as diagrammed by (Avgerinou & Pettersson, 2020, p 439) it could perhaps be described as the engine. Perceiving visually requires an entire system. The students' responses (see Figure 19) are as follows:

- *I have used sketchnoting recently to revamp my early more scribbled notes into more visually appealing cohesive sketches. By doing this forced me to reevaluate my current ideas and expound on them. This process creates more fleshed out strong idealization.*

- *I use sketchnoting during my workflow for example I use it for my task list. It makes it less intimidating and eases the stress that is attached to the work. I find it easier to break down into chunks and*

I'm able to refer back to it and remember my tasks much easier.

- *I think that it requires you to create instantaneous symbols to represent your thoughts or a piece of information. Even if the symbol does not seem 100% logical you came up with that link between the image and the information for a reason so there must be something there behind that idea. You did it for a reason, and I think exploring why you chose that symbol is where more ideas and creativity come from.*
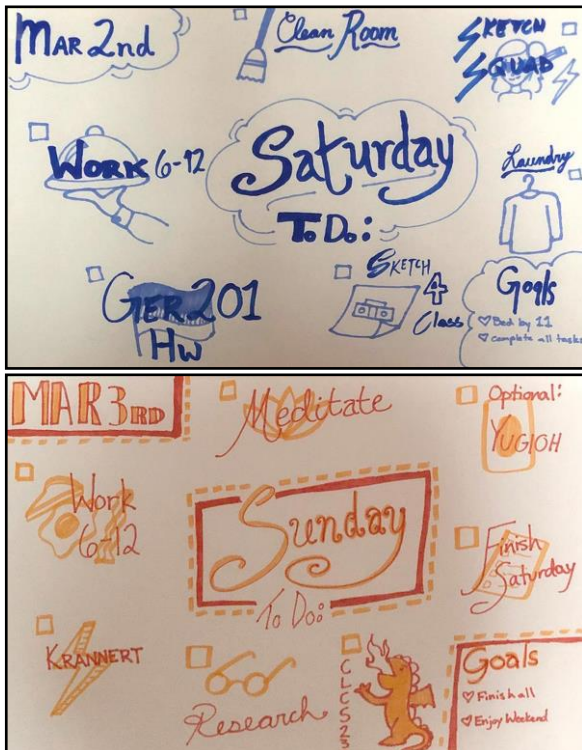

Figure 19. Student's visual task list. Students sketchnoted their daily tasks to organize and prioritize them (2019).

CONCLUSION

With little practice for some sketchnoting seems to provide an almost immediate satisfaction of being able to communicate on paper. In the above-mentioned contexts sketchnoting has been successfully used as a problem framing and idea generation framework, to visually synthesize complex information, to explore and visualize problems as well as to develop high-level concepts; both, individually and in team settings. Acquiring visualization skills to communicate ideas freely and easily without fear of imperfection and mistakes is the first step to trusting one's own creative ability (Kelley & Kelley, 2013). By no means is sketchnoting the end-all, however, it can be practiced easily and in various settings such as in meetings, at conferences, and talks. For some it has proven to increase sketch confidence and allow for the creative flow to happen much more freely, through finding one's own visual voice, encouraging collaboration and triggering unexpected and disruptive ideas (McGregor, 2019; Paepcke-Hjeltness & Henry, 2017; Rohde, 2013)

In summary, the students who embraced sketchnoting found it allows them to structure and generate creative solutions as part of their design process. These students confirmed that sketchnoting gives them a sense of empowerment that goes beyond mere sketch confidence. Several students shared how it made a difference during job interviews. The overwhelmingly positive response and results shed a clear light on a major opportunity for sketchnoting, as a low fidelity, fast-paced visualization framework to play a much larger role in design education beyond being a visual note-taking tool. Looking at VL through the sketchnoting lens, we hope to have provided arguments that support the idea it can promotes all five pillars of VL theory as defined by Avgerinou and Pettersson (2011, 2020).

More research needs to be done to better understand the relationship between sketchnoting and VL. The researchers' intention is to continue this research and further look into how sketchnoting can foster VL and help students grow into well-rounded experts through learning the sketch-noting process, allowing them to visually think and communicate in fast-paced, at times intimidating environments and have the foundational confidence to achieve greater success in the future.

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